

# Application of health quotient to enhance chronic periodontitis treatments

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**Objectives:** Based on the concept of health quotient (HQ), we designed and facilitated personalized plans to improve patients' compliance and oral health. The study aims to increase HQ level of patients with chronic periodontitis from four aspects, namely self-care, health knowledge, lifestyle, and mental health, and evaluate the effects of HQ training in maintaining oral health.

**Method:** In total, 105 patients with chronic periodontitis were recruited from Capital Medical University-Affiliated Beijing Chaoyang Hospital from January 2015 to January 2017. The patients were randomly split into two groups (control versus test). All the patients received standard periodontal treatments. In addition, patients in the control group received conventional oral health instructions, and patients in the test group received the HQ training. At the end of the training, oral health status of both groups was evaluated and recorded.

**Results:** The oral health status and the HQ scores were significantly better in the test group than the control group ( $P < 0.01$ ). The training in HQ provided a better guidance for patients in oral health maintenance and further improved patients' compliance.

**Conclusion:** HQ training for patients with chronic periodontitis increased their scores in self-care and health knowledge and significantly slowed down the progression of chronic periodontitis.

**Keywords:** health quotient, HQ, chronic periodontitis, oral health, systemic inflammation

## Introduction

Periodontal disease is an inflammatory process of the periodontium (ie, gingiva, supporting connective tissue, and alveolar bone) that anchors teeth to the jawbones.<sup>1</sup> Chronic periodontitis, the most common periodontal disease in adults, is caused by subgingival dental plaques.<sup>1</sup> Chronic periodontitis contributes to the initiation and progression of other systemic diseases, such as diabetes mellitus and atherosclerosis.<sup>2</sup> It has been shown that improvements of oral hygiene alleviate systemic inflammation and distant tissue damages.<sup>2</sup> To maintain oral hygiene and oral health, patients should have periodic dental examinations and regular dental plaques/calculus removal.<sup>3,4</sup> Etiologic stimulants (eg, oral microbiome) may affect each patient differently.<sup>5</sup> Therefore, the periodontal treatment plan and health quotient (HQ) educational program need to be comprehensive and individualized.

Despite the wide range of oral health educational programs, periodontal health of the general population in People's Republic of China was not significantly improved due to the poor patient compliance.<sup>6</sup> In accordance with the guidelines of preventive medicine and behavior change techniques (BCT), HQ advocates the concept of holistic health promotion by improving an individual's health-related knowledge, living and working environments, and lifestyles.<sup>7,8</sup> BCT is an observable and replicable strategy

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that can actively intervene health-related behaviors and alter causal processes of diseases.<sup>8</sup> Effective BCTs have been applied to promote healthy lifestyles and enhance holistic health status.<sup>9-11</sup> Applying this concept, the HQ self-reported questionnaire was firstly designed and validated in 2001.<sup>7</sup> It divides the holistic health into five domains: self-care, health knowledge, lifestyle, mental health, and life skills.<sup>7</sup> The maintenance of optimal HQ is beneficial for the patients with chronic disorders and can help them maintain a healthy lifestyle.<sup>7,12</sup> Chronic periodontitis is a long-term inflammation and is considered as a chronic disease that may affect systemic health.<sup>2</sup> However, the HQ training of patients with chronic periodontitis has not been investigated in depth. In this study, we applied the HQ concept to formulate a personalized and comprehensive periodontal treatment plan for each patient, and then evaluated the effects on patients' health-related behaviors.

## Methods

### Data collection

The current study protocol was approved by the Institutional Review Board of Ethic Committee of Capital Medical University-Affiliated Beijing Chaoyang Hospital, Beijing, People's Republic of China (Protocol No: 2016-Division-140). The study was conducted in the Capital Medical University-Affiliated Beijing Chaoyang Hospital from January 2015 to January 2017. Chronic periodontitis was diagnosed based on the Classification System for Periodontal Diseases and Conditions published in 1999, and the clinical symptoms include periodontal pocket >3 mm, bleeding on probing, attachment loss, and/or tooth mobility.<sup>13</sup> The patients with chronic periodontitis who were capable of performing daily oral cleaning and regular communication were recruited from our dental clinic and randomly assigned to either a control group or a test group. We excluded the patients with only gingivitis, patients who were not able to perform daily oral cleaning, or patients who were unconscious or incapable of communication. All the enrolled patients in the current study signed the informed consent agreements.

We designed and administered our procedure based on the CONSORT guidelines.<sup>14</sup> Prior to the treatment, HQ and oral health status of the participants were evaluated and recorded by the nurses in our clinic. The nurses have been trained to deliver oral health instructions oral health instructions and calibrated for survey administration and HQ scoring. Both groups received standard periodontal treatments. After the standard periodontal treatments, patients in the control group received regular oral hygiene instructions, while the test group received the HQ training.

The HQ training contents included personalized plans for oral health maintenance (eg, effective methods for brushing and flossing), relevant knowledge of systemic diseases and chronic periodontitis, as well as the importance of early nursing intervention and patient compliance. In the follow-up period, participants in the test group received one phone interview for 15 minutes. We evaluated the HQ score and oral health status at multiple time points: after 2-4 sessions of periodontal scaling, as well as at the 3-month and 6-month posttreatment follow-up appointments.

### Survey tools and statistical analysis

Sociodemographic information of the participants, including gender, age, education level, family income, and medical history, was collected. The HQ self-reported questionnaire was applied to record participants' holistic health status. There are five dimensions (self-care, health knowledge, lifestyle, and mental health) with 20 questions in each dimension.<sup>7</sup> There are seven options for each question, ranging from extremely disagree (0 point) to extremely agree (6 points). There are 600 points in maximum in this HQ questionnaire. HQ index of a particular factor is defined as the score of each section divided by three. The score is positively correlated with patients' health status. Oral Health Impact Profile-14 (OHIP-14), a validated questionnaire derived from OHIP-49 in 1997, was also utilized in the study.<sup>15</sup> There were fourteen self-reported questions to evaluate the associations between sociodemographic status and oral health variables, ranging from never (0 point), seldom (1 point), and sometimes (2 points) to often (3 points) and always (4 points).<sup>15</sup> The higher score indicates the poorer oral health.<sup>15</sup> Data were analyzed using a two-tailed *t*-test or one-way analysis of variance, and the differences were considered statistically significant when  $P < 0.01$ .

## Results

### Clinical features

One hundred and five patients were enrolled in this study, including 53 male and 52 female participants. The mean age of our enrolled patients was 41.5 years, with most of them being in the 45 to 59-year age group (65 patients, 61.5%), followed by the 35 to 44-year age group (39 patients, 38.5%). In our study, the education level of 48 patients (45.7%) was below junior high school, followed by college graduates or beyond (34 patients, 32.4%) and senior high school (23 patients, 21.9%). Monthly income (RMB/month/person) of our patients varied from 500 to 1,000 (20 patients, 19.1%), 1,000 to 3,000 (30 patients, 28.5%), 3,000 to 5,000 (40 patients,

**Table 1** Evaluation of overall health

HQ domain	Cases	X ± SD Pretraining	X ± SD Posttraining	t	P-value
Lifestyle	105	42.29±7.56	61.49±6.43	-19.996	<0.001
Mental health	105	37.82±7.68	61.33±6.66	-25.099	<0.001
Self-care	105	34.86±6.92	62.38±6.58	-28.843	<0.001
Health knowledge	105	42.29±7.56	62.71±6.83	-19.632	<0.001

**Abbreviations:** HQ, health quotient; SD, standard deviation.

38.1%), and more than 5,000 (15 patients, 14.3%). Most of the patients (90 patients, 85.7%) had a medical history of diabetes, hypertension, or cardiovascular diseases.

The HQ self-reported questionnaire was applied to record participants' holistic health status. Our results (Table 1) revealed that patients' HQ scores in all the domains (ie, lifestyle, mental health, self-care and health knowledge) were significantly higher after the HQ training ( $P<0.001$ ), suggesting the importance of HQ training and nursing intervention.

Additionally, we applied the OHIP-14 scale to evaluate the oral health status of the enrolled patients, and then we compared the scores of the control group and the test group. Higher score indicates poorer oral health. Our results (Table 2) demonstrated a significant improvement in oral health when the patients received personalized health education ( $P<0.001$ ).

## Discussion

Chronic periodontitis is one of the major oral diseases in the world, as well as one of the leading causes for tooth loss in adults.<sup>1</sup> In People's Republic of China, the incidence of chronic periodontitis is higher than that of caries.<sup>16</sup> Variable circulating inflammatory cytokines, such as TNF- $\alpha$ , IL-1, and IL-6, have been identified in chronic periodontitis.<sup>1,2</sup> Dysregulation of cytokine networks stimulates abnormal host responses (eg, elevated cytokine levels and production of autoantibodies) that may exacerbate systemic inflammation and is associated with the initiation and progression of chronic diseases.<sup>1,2</sup> Optimal oral hygiene can significantly reduce the

severity of some systemic diseases, such as diabetes mellitus.<sup>2</sup> HQ reflects the attitude and awareness to personal health of an individual. In addition, HQ stands for the consciousness, knowledge, and ability of health maintenance. HQ can be further divided into body quotient, moral quotient, relationship quotient, and spiritual quotient. HQ is composed of five dimensions: self-care, health knowledge, lifestyle, mental health, and life skills. The self-care dimension evaluates illness management skills, holistic health awareness, and positive personality.<sup>7</sup> The health knowledge dimension assesses the understanding of health-related topics, the health care system, and health maintenance issues.<sup>7</sup> The lifestyle dimension checks a wide range of life habits, such as substance abuse, sleep patterns, and exposure to environmental hazards.<sup>7</sup> The mental health dimension examines mental, psychological, and emotional status; personal beliefs; and stress level.<sup>7</sup> The life skills dimension evaluates social care, social support, and critical life skills.<sup>7</sup> Maintenance of high HQ helps patients keep their healthy habits.<sup>12</sup> However, the current understanding for patients with chronic periodontitis was limited.

Our study investigated the HQ status in patients with chronic periodontitis. The results can guide nursing staff to develop a personalized health educational program and help patients improve their self-management in oral health. Our results indicated that personalized HQ education can improve the overall oral health in patients. HQ has become a popular topic in health education. According to the HQ theory, it is beneficial for an individual to transform the attitude and knowledge of health into daily habits.<sup>9-11</sup> Based on the principles of health education, there is a discrepancy (16%) between knowledge awareness and behavior incidence. To increase the HQ level, we need to emphasize health education from multiple aspects. In nursing practice, we should actively provide personalized health educational programs to the middle-aged patients with chronic disorders.<sup>17</sup> Through the effective health education, patients will be more aware of their health status, and more capable of building up their health knowledge.<sup>17,18</sup> Eventually, the overall HQ level will be enhanced.

**Table 2** Comparison of oral health evaluation between two groups after HQ training

Group	Oral health influences scale X ± SD	t	P-value
Test	7.54±4.08	3.56	<0.001
Control	23.21±6.43		

**Abbreviations:** HQ, health quotient; SD, standard deviation.

Thus far, there was no study applying HQ on the patients with chronic periodontitis.<sup>18</sup> Our study demonstrated a positive impact of HQ on holistic health status, both at the individual and group level. The research has shown that it is effective to help patients with chronic disorders maintain their healthy habits by the HQ educational programs. However, the workload in our dental clinic is beyond the capacity of dentists. It is challenging for the dentists to provide comprehensive oral hygiene instructions with the follow-up sessions in addition to the clinical routines. In this regard, it is critical to establish an effective multidisciplinary health care team. We can further enhance patients' understanding of disease prevention, and thus improve patients' compliance to periodontal treatments. This strategy will efficiently slow down the progression of chronic periodontitis and alleviate the damages to other organ systems.

## Conclusion

Our results revealed that personalized educational programs targeted patients' individual needs, and provided them better guidance in maintaining optimal oral health status. Moreover, personalized educational programs significantly improved patients' compliance to periodontal treatments. This effective strategy not only decreased the severity and progression of chronic periodontitis but also alleviated distant tissue damages.

## Disclosure

The authors report no conflicts of interest in this work.

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